

# Claims

- [c1] What is claimed is:
1. An optical disc drive circuit comprising:  
a bus interface for communications with a host;  
an interface unit electrically coupled to the bus interface for downloading operational firmware from the host;  
a control circuit electrically coupled to the interface unit for transferring the downloaded operational firmware to a volatile memory; and  
a microprocessor electrically coupled to the control circuit for executing the downloaded operational firmware while stored in the volatile memory;  
wherein the microprocessor controls the normal operations of the optical disc drive according to the downloaded operational firmware.
  - [c2] 2. The optical disc drive circuit of claim 1 wherein the bus interface conforms to USB, IDE, SATA, SAS, or SCSI interface standards.
  - [c3] 3. The optical disc drive circuit of claim 1 wherein the interface unit is a macro.
  - [c4] 4. The optical disc drive circuit of claim 3 wherein the

macro comprises handshaking, data reception, and writing received data into the memory functions.

- [c5] 5. The optical disc drive circuit of claim 1 wherein the interface unit further downloads initialization data for the optical disc drive.
- [c6] 6. The optical disc drive circuit of claim 1 wherein the control circuit is electrically coupled to a non-volatile memory which stores initialization data without storing operational firmware.
- [c7] 7. The optical disc drive circuit of claim 1 wherein the host is a computer system.
- [c8] 8. The optical disc drive circuit of claim 1 wherein the microprocessor executes the downloaded operational firmware without accessing a non-volatile memory.
- [c9] 9. The optical disc drive circuit of claim 1 wherein the normal operations of the optical disc drive at least include reading data from an optical disc.
- [c10] 10. The optical disc drive circuit of claim 1 wherein the volatile memory comprises the downloaded operational firmware being executed by the microprocessor to control normal operations of the optical disc drive.
- [c11] 11. An optical disc drive comprising a download mode

wherein operational firmware is downloaded from an external host and stored into a volatile memory of the optical disc drive, followed by a normal mode wherein a microprocessor of the optical disc drive executes the stored operational firmware to control normal operations of the optical disc drive.

[c12] 12. The optical disc drive of claim 11 wherein the normal operations of the optical disc drive at least include reading data from an optical disc, processing the data, and transferring the processed data to the host.

[c13] 13. The optical disc drive of claim 11 wherein data required for the initialization of the optical disc drive is downloaded from the external host to initialize the optical disc drive before the operational firmware is downloaded.

[c14] 14. The optical disc drive of claim 11 wherein the operational firmware is downloaded over a bus interface conforming to USB, IDE, SATA, SAS, or SCSI interface standards.

[c15] 15. The optical disc drive of claim 11 wherein the host is a computer system.

[c16] 16. A method of operating an optical disc drive, the optical disc drive comprising a control circuit connected to

a microprocessor, a volatile memory, and a bus interface connected to a host, the method comprising:  
downloading operational firmware from the host;  
writing the operational firmware into the volatile memory; and  
the microprocessor executing the operational firmware in the volatile memory to control normal operations of the optical disc drive.

[c17] 17. The method of claim 16 further comprising downloading data required for the initialization of the optical disc drive from the external host before the operational firmware is downloaded.

[c18] 18. The method of claim 16 wherein the operational firmware is downloaded over a bus interface conforming to USB, IDE, SATA, SAS, or SCSI interface standards.

[c19] 19. The method of claim 16 further comprising the optical disc drive transmitting an electrical signal to an application program in the host to begin downloading the operational firmware.

[c20] 20. The method of claim 16 wherein the host is a computer system.

[c21] 21. A computer system comprising:  
a host computer comprising operational firmware for

controlling operations of an optical disc drive; and  
an optical disc drive comprising:  
a volatile memory comprising the operational firmware  
downloaded from the host computer over a connecting  
bus interface; and  
a microprocessor executing the operational firmware in  
the volatile memory for controlling normal operations of  
the optical disc drive.

[c22] 22. The computer system of claim 21 wherein the normal operations of the optical disc drive at least include controlling the rotational speed of an optical disc in the optical disc drive and reading data from the optical disc.

[c23] 23. The computer system of claim 21 wherein the bus interface conforms to USB, IDE, SATA, SAS, or SCSI interface standards.

[c24] 24. The computer system of claim 21 wherein data required for the initialization of the optical disc drive is downloaded from the external host before the operational firmware is downloaded.

[c25] 25. An optical disc drive controller comprising:  
a bus interface for communications with a host;  
a volatile memory for storing operational firmware  
downloaded from the host;

a microprocessor for controlling normal operations of the optical disc drive by executing the operational firmware stored in the volatile memory;  
an RF circuit; and  
a control circuit connected to the bus interface, the volatile memory, the microprocessor, and the RF circuit.

[c26] 26. The optical disc drive controller of claim 25 wherein the volatile memory comprises the downloaded operational firmware being executed by the microprocessor to control normal operations of the optical disc drive.

[c27] 27. An optical disc drive circuit used in a host system, wherein the optical disc drive circuit has operational firmware downloaded from the host system to a volatile memory through a bus interface every time after the host being powered on, the optical disc drive circuit comprising:

a microprocessor for executing the downloaded operational firmware while stored in the volatile memory;  
wherein the microprocessor controls the normal operations of the optical disc drive according to the downloaded operational firmware.

[c28] 28. The optical disc drive circuit of claim 27 wherein the bus interface conforms to USB, IDE, SATA, SAS, or SCSI interface standards.

- [c29] 29.The optical disc drive circuit of claim 27 wherein the microprocessor accesses a non-volatile memory which stores initialization data without storing operational firmware.
- [c30] 30.The optical disc drive circuit of claim 27 wherein the host system is a computer system.
- [c31] 31.The optical disc drive circuit of claim 27 wherein the microprocessor executes the downloaded operational firmware without accessing a non-volatile memory.
- [c32] 32.The optical disc drive circuit of claim 27 wherein the host system comprises the volatile memory.
- [c33] 33.The optical disc drive circuit of claim 27 wherein the host system comprises a host controller accessing the volatile memory that is shared by the host system and the microprocessor during the normal operation.
- [c34] 34.The optical disc drive circuit of claim 27 wherein the volatile memory is accessed only by the optical disc drive circuit on the normal operation.
- [c35] 35.The optical disc drive circuit of claim 27 wherein the optical disc drive circuit comprises the volatile memory.